

# Incorporating Port-Level Foreign Trade Data into IMPLAN's Gravity Model

MCRSA 49<sup>th</sup> Annual Meeting

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Kansas City, MO

IMPLAN



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# Agenda

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1. Brief overview of IMPLAN's gravity model
2. Incorporating port-level foreign trade data into the gravity model
  - a. Why?
  - b. How?
  - c. Preliminary results
3. Remaining questions and plans for future research

# 1. IMPLAN'S GRAVITY MODEL

# IMPLAN's Gravity Model

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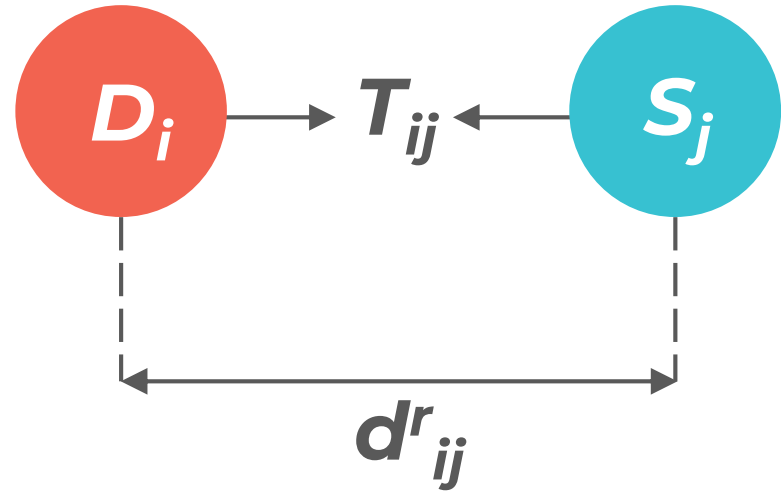
- Used to estimate county-to-county trade flows of all goods and services
  - Allows for MRIO analysis
  - Accounts for cross-hauling
  - Captures feedback effects

# Gravity Model of Domestic Trade

**Mass:** Supply of shipping county and Demand of receiving county (commodity-specific)

**Distance:** ORNL county-to-county impedances for truck, rail, and water (commodity specific)

**Force:** Trade between the two counties



# Foreign Trade

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- Gravity model currently used to estimate domestic trade flows only
- Current assumption: constant foreign trade rates for all states and counties
- Hypothesis: counties closer to ports will import/export from/to foreign countries at a greater rate than other counties, *ceteris paribus*

# 2.

## INCORPORATING PORT- LEVEL TRADE

# Data and Methodology

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- U.S. Census Bureau Customs Port Data
  - Foreign exports and imports of shippable commodities by U.S. port
  - Foreign exports = “demand” by the port that must come from U.S. counties
  - Foreign Imports = “supply” from the port that must go to U.S. counties
  - Each port is given impedances based upon the state and county in which it is located
  - Now we have all the necessary elements for inclusion in the gravity model
- Non-shippable commodities (i.e., services)?

# Preliminary Results

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## Quality Control Checks

- ❑ FIMRs and FEXRs unchanged for non-shippable commodities
- ❑ FIMRs and FEXRs previously 0 remain 0
- ❑ FIMRs and FEXRs previously non-zero remain non-zero
- ❑ The sum of all counties' foreign exports of each commodity remained unchanged—and equivalent to U.S. control (likewise for foreign imports)

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# Preliminary Results

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## Foreign Exports of Beet Sugar

- Produced in just 31 U.S. counties
- U.S. FEXR in 2015 was 2.24%



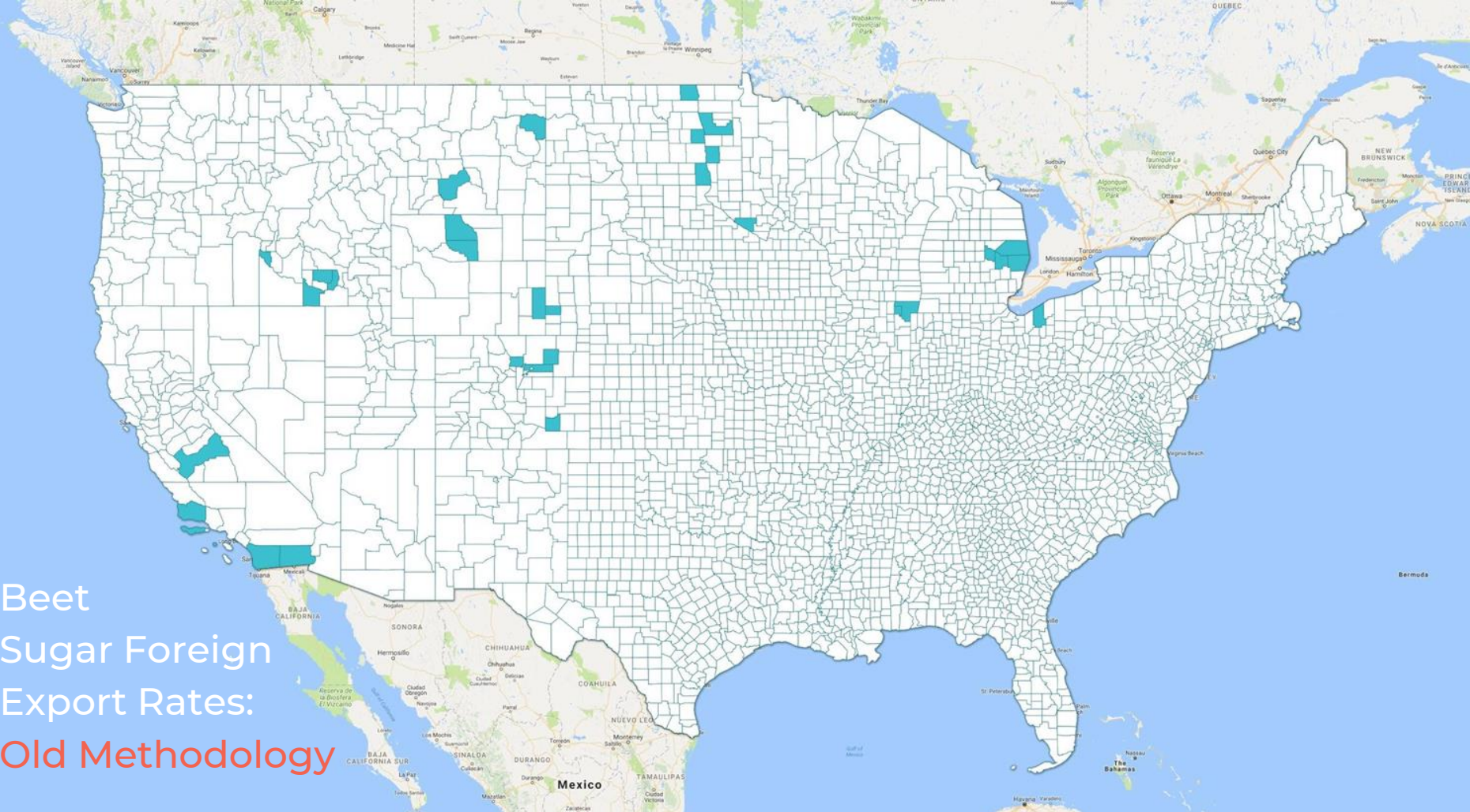
# Preliminary Results

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## Foreign Exports of Beet Sugar

- Under the old methodology:
  - Each of these 31 counties exported 2.24% of the value of their production to foreign destinations.
  - The foreign export value varied by county solely as a function of each county's level of output and was not influenced by the counties' relative proximity (in terms of cost of transporting the commodity) to a customs port.
  - Polk County, MN had largest foreign export value due to its being the county with the largest output value; Canyon County, ID had the second-largest foreign export value due to its having the second-largest output value

Beet  
Sugar Foreign  
Export Rates:  
Old Methodology



# Preliminary Results

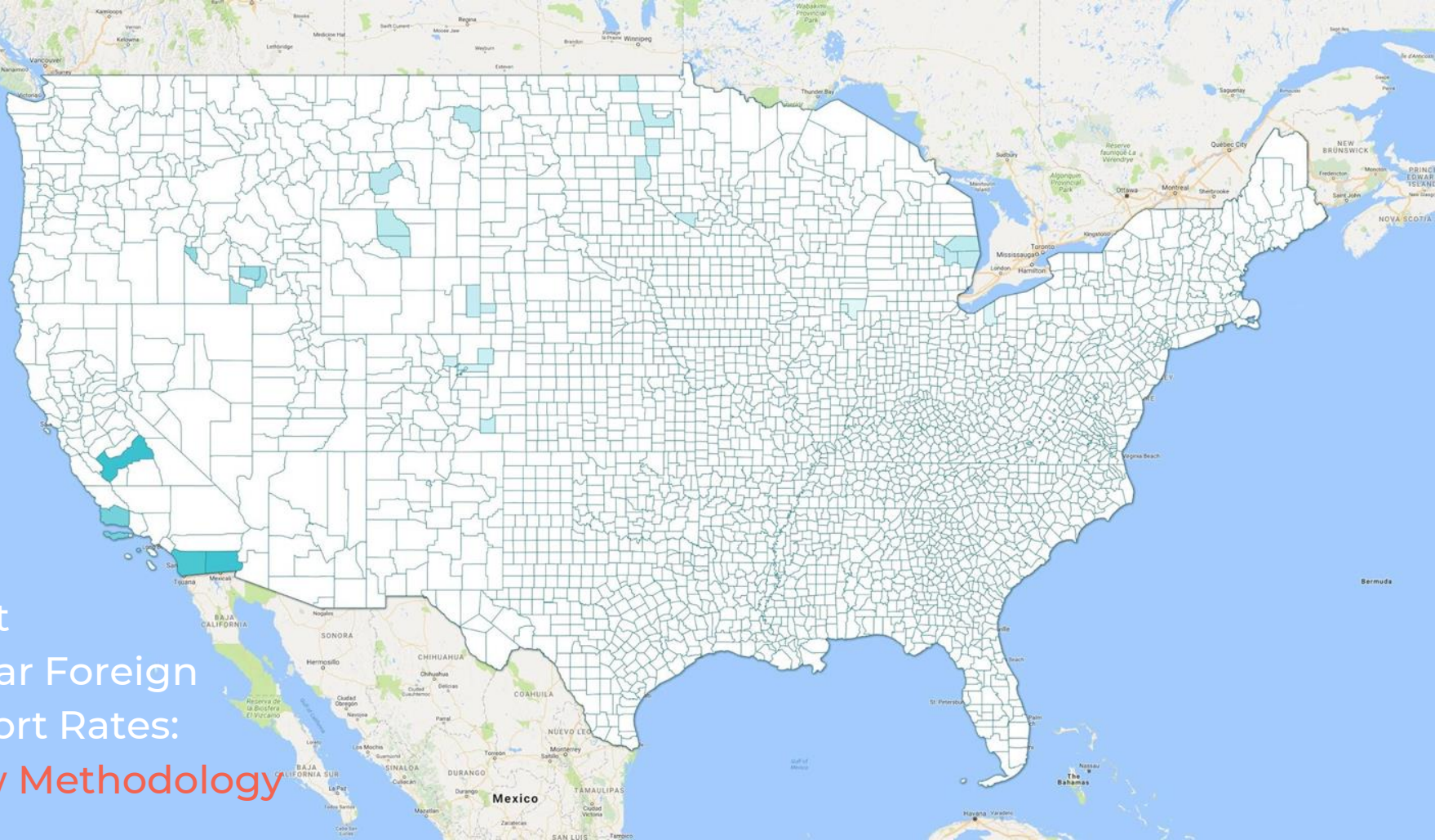
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## Foreign Exports of Beet Sugar

- Under the new methodology:
  - The county FEXRs depend on both output level and relative proximity to customs ports,
  - County FEXRs range from 0.83% (DuPage County, IL) to 6.52% (Fresno County, CA)
  - Canyon County, ID overtook Polk County, MN in terms of export value due to its closer proximity to a customs port (FEXR = 2.68%)



Beet  
Sugar Foreign  
Export Rates:  
New Methodology



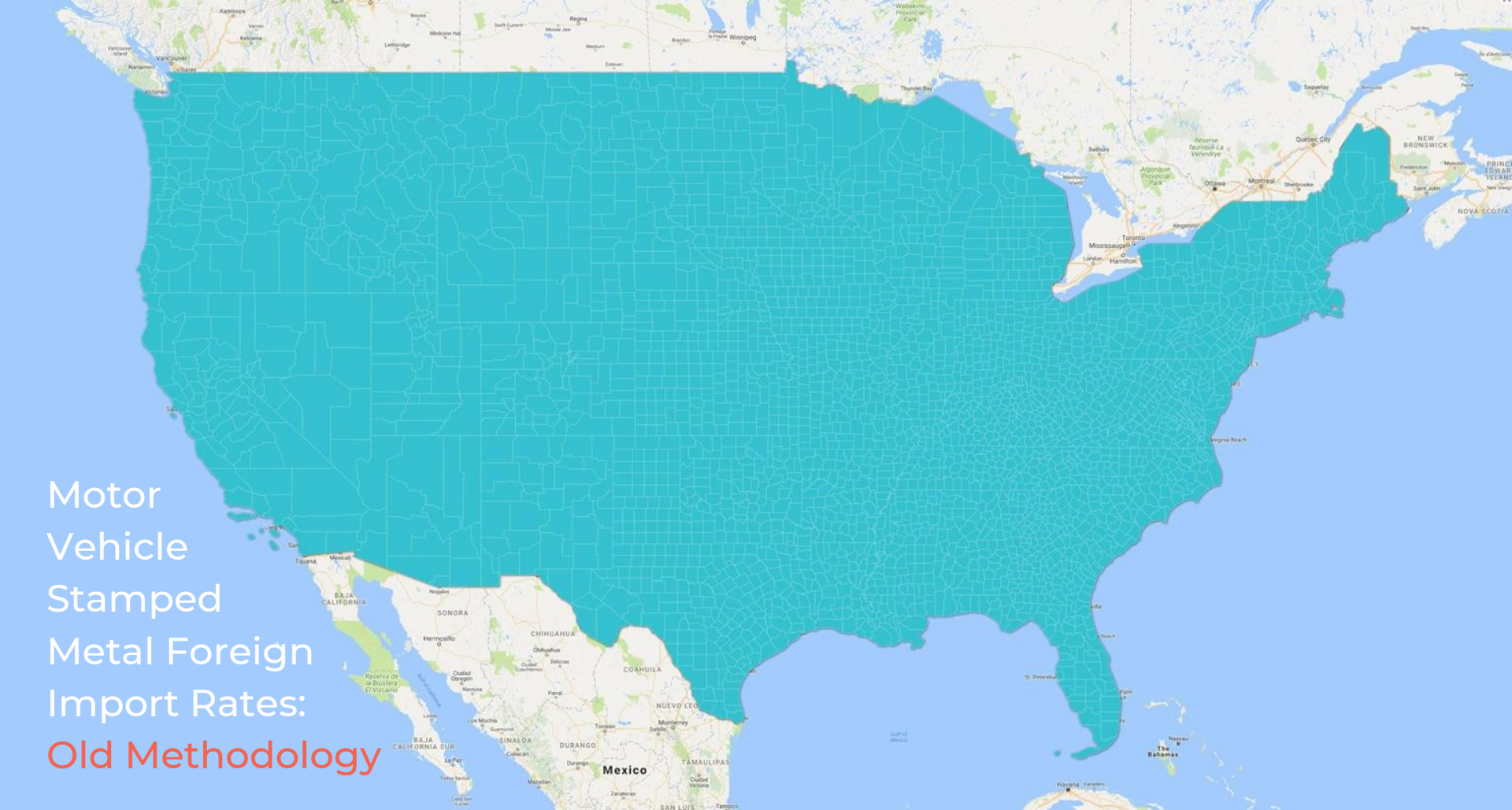
# Preliminary Results

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## Foreign Imports of Motor Vehicle Stamped Metal

- U.S. FIMR in 2015 was 3.03%
- Under the old methodology:
  - Each county imported 3.03% of the value of their demand from foreign sources
  - The foreign import value varied by county solely as a function of the demand level of each county and was not influenced by the counties' relative proximity to a customs port
  - Wayne County, MI had the largest demand value and thus also had the largest foreign import value, followed by Jefferson County, KY, Clay County, MO, Rutherford County, TN, and Macomb County, MI

Motor  
Vehicle  
Stamped  
Metal Foreign  
Import Rates:  
Old Methodology



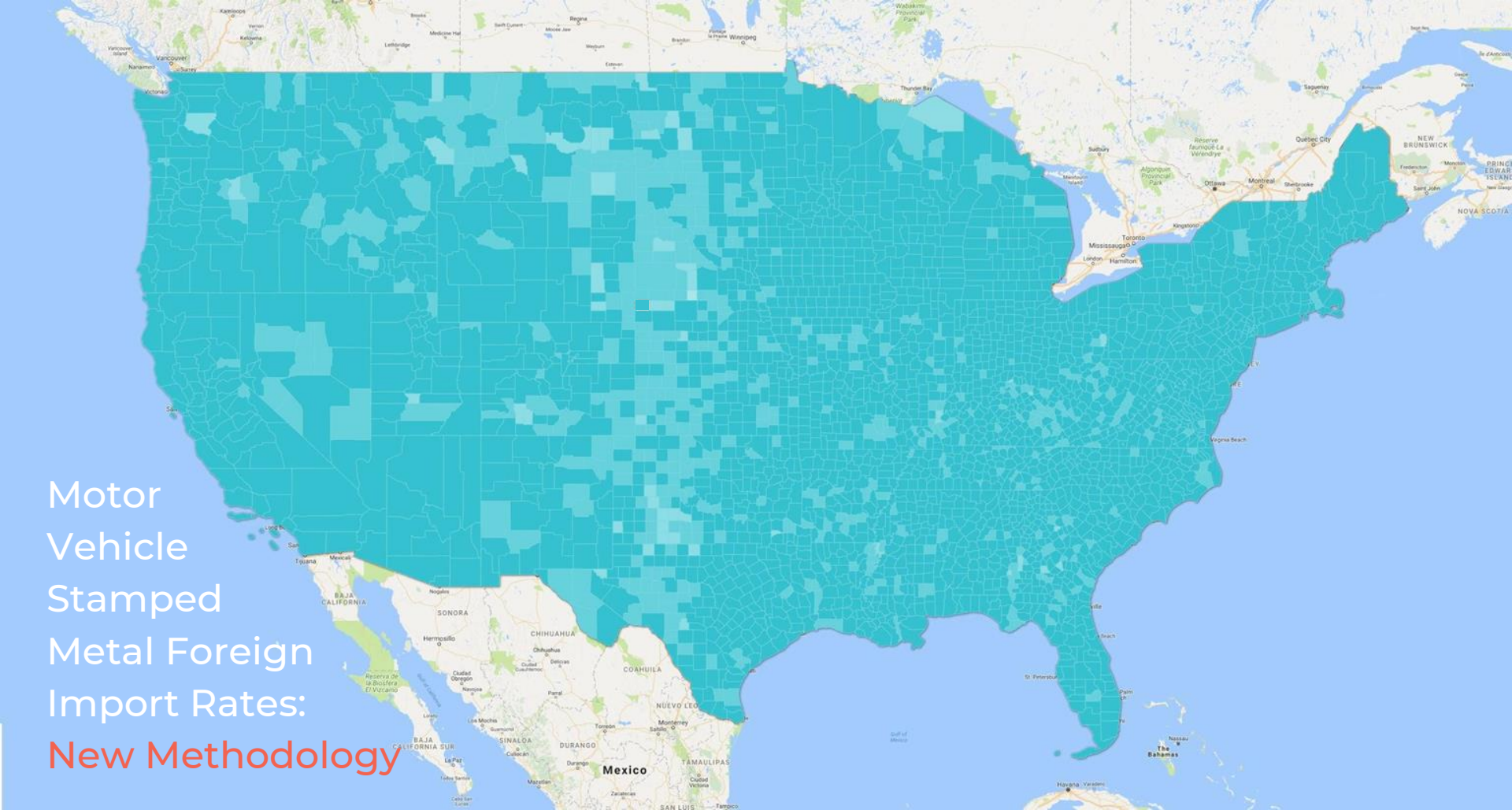
# Preliminary Results

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## Foreign Imports of Motor Vehicle Stamped Metal

- Under the new methodology:
  - FIMRs ranged from 1.00% (Loup County, NE) to 3.15% (Orange County, CA)
  - Wayne County, MI is still the largest importer of motor vehicle stamped metal by value, but its foreign import rate is a bit below the national average, at 3.00%

Motor  
Vehicle  
Stamped  
Metal Foreign  
Import Rates:  
New Methodology



# 3. QUESTIONS AND FUTURE WORK

# Remaining Questions and Future Work

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- Does the assumption hold for all shippable commodities?
  - Further testing by commodity
  - Add constraint of maximum variance from U.S.-level foreign trade rates?
- Add country detail

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